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June 16, 2005

3472.04

Humboldt County Department of Health and Human Services Division of Environmental Health 100 H. Street, Suite 100 Eureka, California 95501

Attention:

Mr. Mark Verhey, C.E.G.

Subject:

Groundwater Monitoring Report; Second Quarter 2005

Former Totem Pole Market, 580 Fortuna Boulevard, Fortuna, California

LOP No. 12028

Dear Mr. Verhey:

LACO ASSOCIATES (LACO) presents to the Humboldt County Division of Environmental Health (HCDEH) the results of groundwater monitoring for the second quarter of 2005. This report has been prepared for our client, Valerie Ellis.

Please call or email if you have any questions or concerns.

Sincerely,

LACO ASSOCIATES

avoline Levesta

Caroline Levenda Staff Geologist

CJL:cs

Attachments

cc:

Valerie Ellis

Christopher J. Watt PG 7586 Exp. 3/31/06

Exp.03/31/

# GROUNDWATER MONITORING REPORT SECOND QUARTER 2005

Former Totem Pole Market 580 Fortuna Boulevard, Fortuna, California LOP No. 12028; LACO Project No. 3472.04

### INTRODUCTION

Field activities were conducted on May 2, 2005, in accordance with generally accepted practices at this or similar locations. Please refer below to Tables A and B for the current groundwater monitoring regime and to the updated *Standard Operating Procedures* in Attachment 4 for details. A location and site map are provided as Figures 1 and 2, respectively. A key to abbreviations is included as Attachment 1.

### SITE CHRONOLOGY

• 1988: Two 1000-gallon underground storage tanks (USTs) closed in place by filling with concrete.

• 1994: Two 1000-gallon USTs removed from site; 180 cubic yards of soil was excavated; 550 gallon waste oil tank was removed.

• 1995 through 2005: Soil borings and monitoring wells were installed to characterize the site.

	Т	able A: S	ampling E	vent for Ma	y 2, 2005		
	SCREENED			WATER	ANAL	YTICALS	
MONITORING WELL ID	INTERVAL (feet)	DTW (feet)	PURGE METHOD	QUALITY PARAMETE RS	ORGANICS	INORGANICS	SAMPLING SCHEDULE
MW1	5-15	10.17	DHP	pH, T, ECw, ORP, DO	TPHg, TPHd, BTEX, MTBE, DIPE, ETBE, TAME, TBA		Quarterly
MW2	5-15	10.08					DTW Only
MW3	5-15			2.9	~=	NA	DIW Only
MW4S	4-9	3.57			ТРНg, ТРНd,		
MW4D	13-18	11.13	DHP	pH, T, ECw, ORP, DO	BTEX, MTBE, DIPE, ETBE,		Quarterly
MW5	15-20	10.31			TAME, TBA		

### HYDRAULIC GRADIENT AND HYDROGEOLOGY

Due to differences in hydraulic conductivity, the site stratigraphy has allowed for two distinct water-bearing units; a perched water bearing unit in the fill material (0 to 2+ feet bgs) and a deep aquifer in the silty and gravelly sands encountered below 12 to 15 feet bgs.

The hydraulic gradient of the deep aquifer was calculated using monitoring wells MW1, MW2, and MW5D and was determined to have a N63°W trend and 1.68 percent slope. A hydraulic gradient map is provided as Figure 3.

### LABORATORY RESULTS

Laboratory analytical results from the May 2, 2005, quarterly sampling event are included below in Table B. Current and historical groundwater analytical data are included in Table 1, and copies of the laboratory analytical report are included as Attachment 3. Key to abbreviations can be found in Attachment 1.

		-	Γable B: A	nalytical R	esults for Ma	y 2, 2005		
WELL	TPHg (µg/L)	TPHd (μg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (μg/L)	Xylenes (μg/L)	MTBE (μg/L)	Additional Analytes (μg/L)
MW1	3,200	330	0.66	ND<0.50	2.9	0.62	ND<1.0	DIPE = 4.1 All others ND<1.0-10
MW4S	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	All others ND<1.0-10
MW4D	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50			All others ND<1.0-10
MW5	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	All others ND<1.0-10

### DISCUSSION OF GROUNDWATER RESULTS

Analytical results for monitoring wells sampled during the second quarter of 2005 are generally consistent within the range of results reported for recent sampling events. For the current reporting period, all analytes at monitoring wells MW4S, MW4D, and MW5 are reported as not detected. The laboratory noted that the groundwater sample taken from monitoring well MW1 does not have a peak pattern consistent with gasoline and has material in the gasoline range. Also, the groundwater sample from monitoring well MW1 contains some material lighter than diesel and in the range of molecular weights of diesel, but the material does not exhibit the peak pattern typical of diesel oil. These comments indicate that the site contains older fuel range material which is weathered and degraded. Additional laboratory notes are included in the case narrative of the laboratory analytical results in Attachment 3.

### DIPE (Di-isopropyl Ether)

Di-isopropyl ether (DIPE) was detected in groundwater samples from monitoring well MW1 for this sampling event, in three of four quarterly sampling events in 2003, and also in last quarter's sampling event on February 28, 2005. DIPE concentrations have ranged from not detected to 4.3 ug/l and have shown no pattern consistent with other constituents.

Concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) have been historically decreasing while concentrations of total petroleum hydrocarbons as gasoline (TPHg) have been historically increasing since 2001 in groundwater samples taken from monitoring well MW1.

The source of DIPE is unknown. In 1988, two USTs were abandoned in place by filling with concrete. In 1994, the two USTs were removed and a 550-gallon waste oil tank was removed. If DIPE was used prior to 1988 as a gasoline additive, then the detection of DIPE in monitoring well MW1 may possibly be due to leaking USTs, dispensers, or lines. However, if DIPE was used as a gasoline additive after 1988, there is a possibility that the DIPE detection is from an unknown source elsewhere. Also, sampling for DIPE utilizing EPA method 8260B began in the year 2003 for this site. Thus, DIPE detections for previous years are unknown. However, DIPE is reportedly used as a solvent in paint thinners, stain removers, medicine, powder and paint cleaning; it has also been used as an extraction agent and gasoline additive (Reciprocal Net and FRIPP). Further investigation of surrounding commercial sites that may use gasoline, paints, paint thinners, or other solvents and the date of DIPE use as a gasoline additive may help determine the source of DIPE.

The DIPE water quality objective is 0.8 ug/l based on the California Regional Water Quality Control Board for the Central Valley Region (Marshack). Information regarding decay rates of DIPE can not be found at this time. Further investigation on the source of DIPE may be necessary for action to be taken and furthermore for site closure.

### **FUTURE WORK**

- Quarterly sampling will continue. The next quarterly sampling event is scheduled for August 2005.
- A report from the recent subsurface investigation is forthcoming.

### REFERENCES

(FRIPP) Fushun Research Institute of Petroleum and Petrochemicals, SINOPEC, "Production of diisopropyl ether through propene hydration" (2004-2005). http://www.fripp.com.cn/en-0301060200.htm

Marshack, J.B.- California Regional Water Quality Control Board, Central Valley Region, "Beneficial Use-Protective Water Quality Limits For Components of Petroleum-Based Fuels", April 1, 2004.

http://www.waterboards.ca.gov/centralvalley/available\_documents/wq\_goals/wq\_limits\_for\_fuels.pdf

Reciprocal Net, Partner Site, "Isopropyl Ether-Reciprocal Net Common Molecules" (2003). http://www.reciprocalnet.org/recipnet/showsample.jsp?sampleId=273...

### LIST OF FIGURES, TABLES, AND ATTACHMENTS

Figure 1: Location Map

Figure 2: Site Map

Figure 3: Hydraulic Gradient (May 2, 2005)

Table 1: Historical Well Data and Groundwater Analytical Results

Attachment 1: Key to Abbreviations

Attachment 2: Groundwater Sampling: Field Data Sheets

Attachment 3: Laboratory Analytical Reports

Attachment 4: Standard Operating Procedures

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PROJECT REPORT OF FINDINGS

CLIENT TOTEM POLE MARKET

LOCATION FORTUNA BLVD., FORTUNA, CA

LOCATION MAP

BY RJM

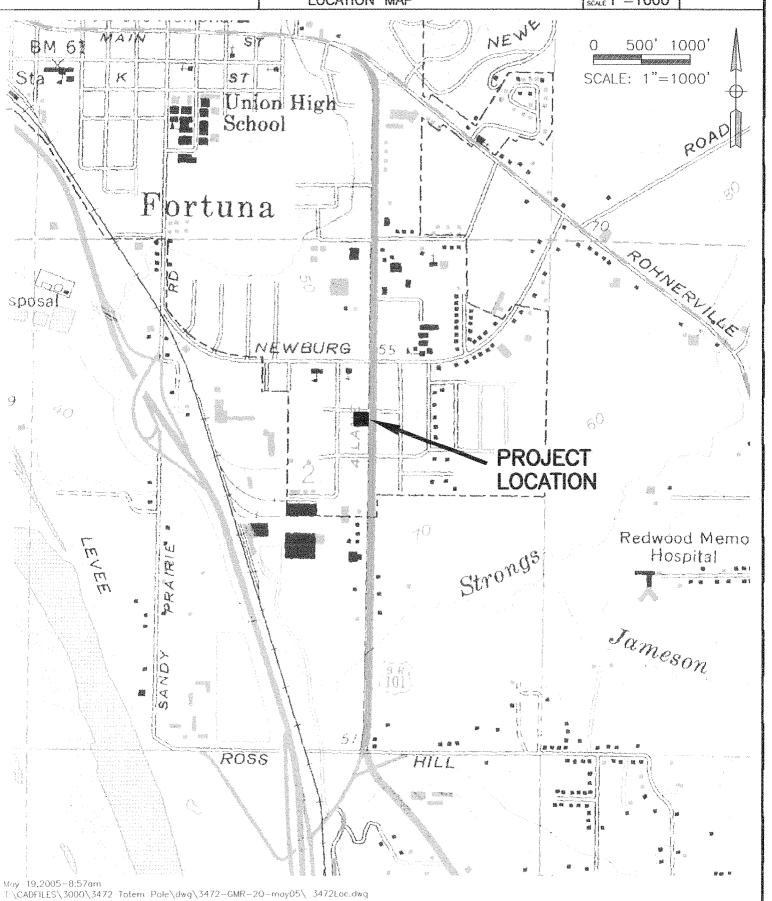
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CHECK

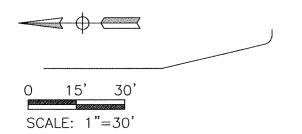
SCALE 1"=1000'

3472.04

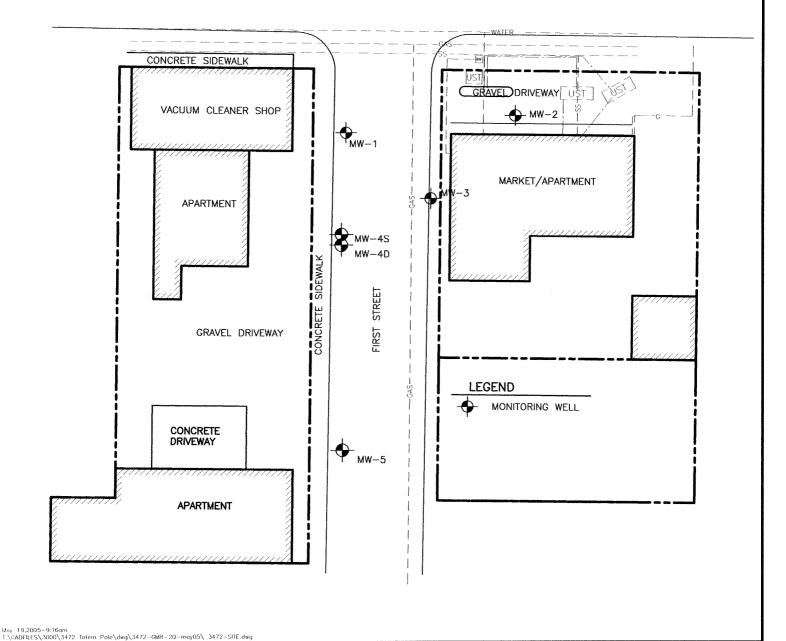




-	PROJECT	GROUNDWATER MONITORING REPORT	<sub>BY</sub> RJM	FIGURE
	CLIENT	TOTEM POLE MARKET	DATE 5/19/05	2
4	LOCATION	FORTUNA BLVD. FORTUNA, CA	CHECK	JOB NO.
		SITE MAP	SCALE 1"=30'	3472.04

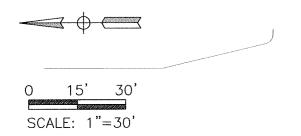


SOUTH FORTUNA BLVD.





	PROJECT	GROUNDWATER MONITORING REPORT	ey RJM	FIGURE
	CLIENT	TOTEM POLE MARKET	DATE 5/19/05	3
ı	LOCATION	FORTUNA BLVD. FORTUNA, CA	CHECK	JOB NO.
		HYDRAULIC GRADIENT MAP (5/02/05)	scale 1"=30'	3472.04



SOUTH FORTUNA BLVD.

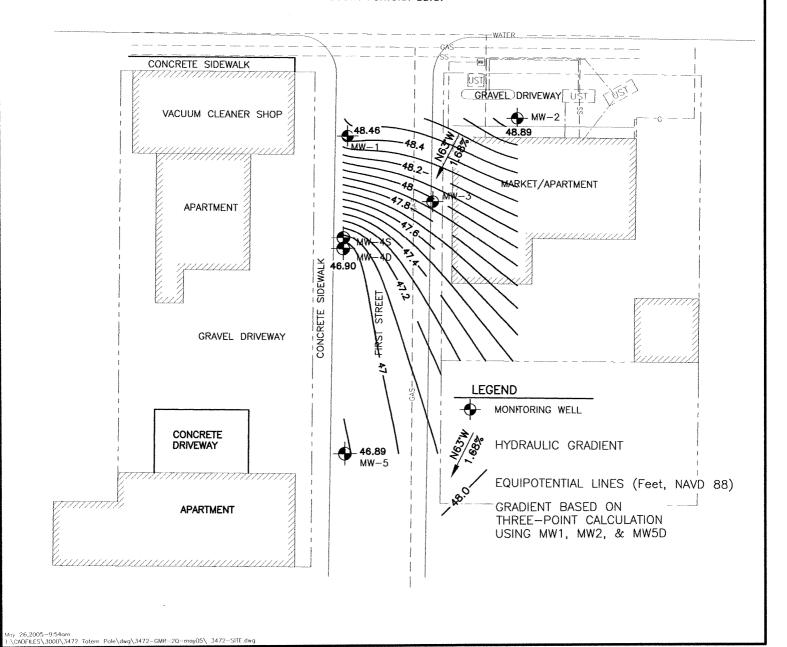


TABLE 1: MONITORING WELL DATA AND GROUNDWATER ANALYTICAL RESULTS Former Totem Pole Market, LACO Project No. 3472.04
580 South Fortuna Boulevard, Fortuna, CA
LOP No. 12028

	Croun	Groundwater Measurements	ents				Anal	Analytical Results			
	Well Head	Well Head Hydraulic Head	Depth to								Additional
WELL/	Elevation (feet	(feet	Water	TPHg	TPHd	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Analytes
Sample Date	NAVD88)	NAVD88)	(feet)	(μg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	, (μg/L)	(ng/L)	(µg/L)
MW.1											
8/12/1996	58.63	44.71	13.92	1.700	ND<500	7.2	ND530	24	72	01200	i
9/6/16/6		44.23	14.40	. 1	1	!	. 1	: 1	:		i
10/8/1996		44.23	14.40	ı	ı	ı	1	;	ł	1	ŀ
11/25/1996		52.63	6.00	1.700	110	31	NDSS	38	20	NPS	I end = ND<0.02
1/9/1997		53.85	4.78	. 1	ŀ	1	1	: 1	: 1		
2/4/1997		53.71	4.92	930	330	87	NTXTO	14	20	NESO	;
3/19/1997		48.58	10.05	1	1	. 1	. 1	: 1	1		i
4/7/1997		46.97	11 66	i	ŀ	1	ļ	į			
5/1/1997		46.52	12.11	790	480	-	1.1	9	16.7	N A S	1
6/3/1997		45.99	12.64	3	ļ	<u> </u>	i	; I	797	1 N	
7/1/1007		45.06	13.57								
20113/1007		44.65	13.08		1	I	l	1	I	*	I
1661/51/6		6.5	0.55	I	ı	1	I	ı	i	1	;
1/16/1998		15.64	9.32	ı	1		1	1	ı	i	1
2/5/1998		48.84	9.79	1,000	190	2.8	ND<2.0	15	ND<10	ND<5.0	****
2/22/1999		51.02	7.61	1	1		I	1	i	ı	ı
3/5/1999		1	ł	830	120	ND<5.0	ND<5.0	12	ND<5.0	ND<5.0	1
5/3/2001		46.41	12.22	4,700	300	14	ND<30	28	38	ND<20	1
9/4/2001		44.68	13.95	1	I	ļ	1	1	i	1	1
11/9/2001		44.73	13.90	i	1	1	1	i	1	1	1
2/25/2003		49.09	9.54	1,900	140	0.85	ND<0.50	5.5	0.74	ND<1.0	
											DIPE = 3.9
2/16/2003		50.81	7.82	1,500	220	ND<0.50	ND<0.50	3.8	ND<0.50	ND<1.0	All others ND
											DIPE = 4.3
8/6/2003		45.04	13.59	2,000	280	4.1	ND<0.50	4.4	1.0	ND<1.0	All others ND
											DIPE = 3.0
11/11/2003		44.66	13.97	2,000	1	4.3	ND<0.50	3.4	1.8	ND<1.0	All others ND
2/17/2004		52.67	5.96	2,600	290	ND<0.50	ND<0.50	5.0	0.53	ND<1.0	ND<1.0-10
5/14/2004		46.32	12.31	2,200	140	1.2	ND<0.50	3.0	1.31	ND<1.0	ND<1.0-10
8/17/2004		44.65	13.98	2,700	l	3.5	ND<0.50	3.1	0.87	ND<1.0	ND<1.0-10
11/30/2004		44.67	13.96	2,900	1	10	ND<0.50	3.0	1.0	ND<1.0	ND<1.0-10
											DIPE = 23
2/28/2005	58.63	49.88	8.75	3,700	160	ND<0.50	ND<0.50	4.4	09.0	ND<1.0	All others ND
5/2/2005		48.46	10.17	3,200	330	99.0	ND<0.50	2.9	0.62	0.150N	

TABLE 1: MONITORING WELL DATA AND GROUNDWATER ANALYTICAL RESULTS

472.04	
cet; LACO Project No. 347	oulevard, Fortuna, CA
otem Pole Mark	Fortuna Bou

Former Totem Pole Market; LACO Project No. 3472
1 OB No. 12028
LOI 100: 12028

	Groun	Groundwater Measurements	ents				Analy	Analytical Results			
	Well Head	Hydraulic Head	Depth to								Additional
WELL/ Sample Date	Elevation (feet NAVD88)	(feet NAVD88)	Water (feet)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	Analytes (µg/L)
WW-2											
8/12/1996	58.97	41.80	17.17	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	1
9661/6/6		44.39	14.58	1	I	1	1	}	l	1	1
10/8/1996		44.41	14.56	i	1	1	i	1	1	1	ì
11/25/1996		54.27	4.70	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	0.77	ND<5.0	Lead = 0.028
1/6/16/1		54.58	4.39	ı	ŀ	١	ı	1	I	!	1
2/4/1997		55.77	3.20	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	ND<0.50	69	!
3/19/1997		54.61	4.36	;	I	ł	1	1	į	ţ	1
4/7/1997		48.95	10.02	1 4 2	i	}	1	1	i	1	1
5/1/1997		54.18	4.79	ND<50	ND<500	ND<0.5	0.55	ND<0.50	1.59	ND<5.0	1
6/3/1997		45.17	13.80	ı	ı	ı	ı	I	1	1	1
7/7/1997		44.79	14.18	ı	1	ı	ı	ı	I	1	i
8/13/1997		44.79	14.18	ı	1	ı	ı	1	1	1	1
1/16/1998		45.34	13.63	ı	I	ı	I	ŀ	1	1	1
2/2/1998		47.40	11.57	ND<50	ND<500	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	ı
2/22/1999		46.32	12.65	ı	1	1	l	I	1	ı	ı
3/5/1999		1	1	ND<50	ł	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<5.0	-
5/3/2001		47.33	11.64	i	1	1	1	1	1	l	}
9/4/2001		44.89	14.08	ND<50	ND<50	ND<0.5	ND<30	ND<0.5	ND<0.5	ND<5.0	ı
11/9/2001		44.98	13.99		-	4 4 5	i	1	i	ı	1
2/25/2003		55.62	3.35	ı	I	ì	į	ı	1	i	1
5/16/2003		54.25	4.72	ı	ı	ı	1	1	ı	ı	i
8/6/2003		45.27	13.70	1	1	1	i	ı	1	į	1
11/11/2003		44.93	14.04	I	i	1	ı	1	1	ł	1
2/17/2004		57.75	1.22	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
5/14/2004		46.23	12.74	I	ı	a de la composição de l	•	I	I	ŧ	I
8/17/2004		44.77	14.20	ì	ŀ	I	ı	I	I	I	I
11/30/2004		45.94	13.03	1	ı	I	ı	1	1	ı	ı
2/28/2005	58.97	56.05	2.92	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
5/2/2005		48.89	10.08	ı	I	I	1	1	1	I	ı

TABLE 1: MONITORING WELL DATA AND GROUNDWATER ANALYTICAL RESULTS Former Totem Pole Market, LACO Project No. 3472.04

levard, Fortuna, CA	
580 South Fortuna Bou	LOP No. 12028

NULL   Notificial Richards (Each Digital Richards))))	WELL/	Well Head						Anan	Analytical Results			
March   Marc		Elevation (feet	Hydraulic Head (feet NAVD88)	Depth to Water	TPHg	PHAT ( ) pm)	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Additional Analytes
	Sample Date	NAV Doo)	(NAVEOS)	(lect)	(T(SH)	(rr/Sn)	(T/SH)	(HB/F)	(न/हम)	(HS/C)	(Hg/L)	(4g/L)
99/19/96         SASS A         41.90         15.55         N 20-20         N												
Mail 1996   444 22   147 3   147 4   147 5	8/12/1996		41.90	16.95	ND<50	ND<200	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	***
1,125,1299   54,10   14,17	9661/6/6		44.92	13.93	I	1	1	l	I	1	1	1
1,14,1979   1,14	10/8/1990	_	44.06	14.79	1	١	1 9	1 9	1 9	1 1	1 }	
1441797   15434   151	11/6/1/90		56.31	40.7	NDC20	ND-20	NCOSO	NDS-0.30	ND-W.50	ND<0.50	NDC3:0	Leau = 0.021
	74/1007		77.07	200	1 2	97	02.000	03 00 01.0	3 00 00	2000	974	
### 11/10/2004   58.15   51.2	7661/4/7		56.00	40.7 10.4	NDCSO	ND-S0	ND<0.50	ND<0.30	ND<0.50	ND<0.50	ND<5.0	:
CATIONNE         SSESS         2.2.2         NRC-SI         NRC-SI<	1661/61/6		00.00	6.2				l	ŀ	***		1
March   Marc	1661/1/4		33,34	5.51	1	1	1	1	1	1	1	I
Mail	2/1/1997		56.53	2.32	ND<50	ND S0	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND 65.0	
March   Marc	6/3/1997		56.30	2.55	1	ı	1	1	I	I	1	1
National Part   National Par	1/1/1/1/		48.10	10.75	1	1	1	1	1	ı	1	1
March   Marc	8/13/1997		44.71	14.14	ı	ı	I	ı	1	1	I	1
Stationary   Sta	1/16/1998		58.34	0.51	1	1	1	1	i	i	ı	ı
	5/5/1008		55 53	3 3 3 2	NDCSO	ND/40	ND<0.50	NDC0 50	NTDC0 50	NDC0 50	NTAKO	
11/19/2014   5.57   5.75   5	0001/66/6		57.05	20.	200	2	OC OCCUPI	OF OVER	or over	oc.ovdv.	0.500	1
STATION   STAT	0001/3/6		00.70	3	1 2	1 2	1 60	1 %	9 9 9 9	1 %	l À	l
9.422011         35.30         4.50         1.50         8.50         ND-50         ND-50 <th< td=""><th>2011/2/2</th><td></td><td>1 ;</td><td>1 }</td><td>NDSON</td><td>ND SO</td><td>ND&lt;0.50</td><td>ND&lt;0.50</td><td>ND&lt;0.50</td><td>ND&lt;0.50</td><td>ND&lt;5.0</td><td>1</td></th<>	2011/2/2		1 ;	1 }	NDSON	ND SO	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	1
1972001	5/3/2001		55.90	2.95	1	•	I	1	l	!	1	I
11/12/2013         51.46         11.39	9/4/2001		44.70	14.15	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<5.0	1
Name	11/9/2001		47.46	11.39	ł		ŀ	*****	1			1
11/12/001   14/13	2/25/2003		54.61	4.24	1	ì	1	I	i	ı	ı	1
Niconomia   1402   14	5/16/2003		55.67	3.18	1	ı	ı	1	1	1	1	!
10112000   55.58   2.87	8/6/7007		44.83	14.02	1	1	1	1	i		1	
Number   N	11/11/2003		55.08	787								
\$1/12004         \$8.11         0.74         ND-59         ND-59         ND-69.50	2007/11/11	_	06.00	70.7		1	I	l	l	!	l	1
1130/2004	2/17/2004		58.11	0.74	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
St   March				,								
Number   N	5/14/2004	_	49.73	21.6	l	l	l	1	1	l	l	!
11/30/2004   58.85   .	8/17/2004		44.70	14.15	I	}	1	l	ı	ŀ	1	i
128/2005   58.85	11/20/00/00		25 50	30.0								
1.28/2005   58.85	1007/05/11	_	60.00	5.40	1	1		l	***	1 4 7	l	
S1/2006   S8.15   S4.76   S1.39   ND-50   ND-0.50   ND	2/28/2005		!	l	1	1	i	I	I	2 1 5	1	1
S	5/2/2008		1	I	ı	ŀ	1	ł	I	1	I	i
Name												
ND-520   ND-620   N												
St/22005   St.03   St.05   S	5/28/2005		54.76	3.39	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
D2/18/2005         58.03         46.10         11.93         ND-59         ND-630         ND-636         ND-636<	5/2/2005		54.58	3.57	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
2/28/2005         58.03         46.10         11.93         ND-560         ND-650         ND-650<	W/AD											
1,128,12065   1,129			0.04		į	į				;	:	
\$2/28/2005         46.90         11.13         ND<50         ND<50         ND<0.50         ND<	S007/87/7		46.10	11.93	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	NOV1:0	ND<1.0-10
2/28/2005         57.20         46.15         11.05         ND	5/2/2005		46.90	11.13	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<1.0	ND<1.0-10
2/28/2005         57.20         46.15         11.05         ND	2/1/2											
6 15 11.05 ND-56 ND-56 ND-636			!									
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BBREVIATIONS AND LABORATORY NOTATIONS  ID < Not detected at or above the method detection limit shown  St. micrograms per liter  St. micrograms per liter  File trois pertoleum hydrocarbons as gasoline  PHét: total petroleum hydrocarbons as diesel	5/2/2005		46.89	10.31	ND<50	ND<50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ZZ 1.0	ND<1.0-10
D <: Not detected at or above the method detection limit shown  ∴ Not analyzed or available  gl: micrograms per liter  PHg: total petroleum hydrocarbons as gasoline  PHG: total petroleum hydrocarbons as diesel	BBREVIATIONS	AND LABORAT	ORY NOTATION	s								
LD <: Not detected at or above the method detection limit shown		•										
vocatarizacio di statinato. gli: micrograma per liter PHg: total petroleum hydrocarbons as gasoline PHd: total petroleum hydrocarbons as diesel	D <: Not detected	at or above the me	thod detection limit	shown								
PHg: total petroleum hydrocarbons as gasoline PHd: total petroleum hydrocarbons as diesel	<ul> <li>Not analyzed or e/l micrograms ner</li> </ul>	avallable liter										
PHG: total petroleum hydrocarbons as diesel	PHg: total petroleur	n hydrocarbons as	gasoline									
	PHd: total petroleur	m hydrocarbons as	diesel									

# Attachment 1

	KEY TO ABBREVIATIONS
3/4"B	Three quarters of an inch diameter bailer
Alk	Alkalinity
BTEX	Benzene; Toluene; Ethylbenzene; m,p- and o- Xylenes
CO <sub>2</sub>	Carbon dioxide
coc	Chain of custody
Cr	Chromium
DHP	Down-hole-pump (submersible pump)
DIPE	Di-isopropyl Ether
Dis	Dissolved
DO	Dissolved Oxygen
DTW	Depth-to-Water
ECw	Electrical Conductivity in water
ETBE	Ethyl Tertiary Butyl Ether
Fe	Iron
FP	Free Product
Mn	Manganese
MTBE	Methyl Tertiary Butyl Ether
N	Nitrogen
NA	Not Applicable
ND<50	non-detect at reporting limits shown
NO <sub>3</sub>	Nitrate
NOT	Sample not analyzed for parameter
ACTIVE	during current sampling event
ORP	Oxidation Reduction Potential
Р	Phosphorous
PCP/TCP	penta- tetra- tri- chlorophenols
pН	Potential of hydrogen
SGC	Silica gel cleanup
SO <sub>4</sub>	Sulfate
Т	Temperature
T&P	Tape and Paste
TAME	Tertiary Amyl Methyl Ether
TBA	Tetiary Butyl Alcohol
TBF	Tertiary Butyl Formate
TIC	Total Inorganic Carbon
TOC	Total Organic Carbon
Tot	Total
TPHd	Total Petroluem Hydrocarbons as Diesel
TPHg	Total Petroluem Hydrocarbons as Gasoline
TPHk	Total Petroluem Hydrocarbons as Kerosene
TPHmo	Total Petroluem Hydrocarbons as Motor Oil
TPHs	Total Petroluem Hydrocarbons as Solvent
μg/L	Micro grams per liter (parts per billion)

<sup>\*\*\*</sup>Note that not all abbreviations in this key are used in the report.

# Attachment 2



DRAWDOWN (FEET) REMARKS

WELL CONDITION

WASTE DRUMS

WATER TRUCK

DOT

MOUF

PARKED OVER

WELL - UNABLE TO

DRUMS

900d

ONSITE

21 West Fourth Street, Eureka, CA 95501 TEL 707.443.5054

gr

FAX 707.443.0553 Page 1 of 2 Tech: SJD Project Mob/Demob time: . 25 / . 25 Name: Forks / Totem Pole Market Project No.: 3472.04 Date: 5-2-05 Time on site: \Z:ZO Time off site: 3130 Golbal ID No.: T0602300028 PM: CJW Mileage: MW4S MW4D WELL No.: MW3 MW<sub>2</sub> MW1 DIAMETER (in) 2.00 2.00 2.00 2.00 2.00 SCREENED 4-9 13-18 5-15 5-15 INTERVAL (ft) 5-15 DEPTH TO 10.08 10.12 11. WATER (ft) FINAL INITIAL FINAL INITIAL FINAL INITIAL INITIAL FINAL INITIAL FINAL рΗ TEMP (°C) Ecw (µmohs) -48 36 -113 ORP (mV) -14 -61 166 0.79 0.97 0.87 1.47 DO (mg/L) 0.33 1.03 OTHER (units) 2:09 1:37 1:53 2:27 TIME 1:08 1:18 METHOD DHP DHP DHP (DHP/CB/B) 0.17 0.19 0.20 RATE (Lpm) 3.0 VOLUME (L) 2.0 3.0 CLOUDY CLOUDY CLEAR CLEAR CLEAR CLOUDY COLOR YELLOWTIM MEO. LIGHT LIGHT NONE SULFUR ODOR RUBBER/FUEL /DEGANIC INTAKE 15.5 DEPTH 14.0 7.0 (FEET) 1155 2:29 1:19 TIME METHOD DHP DAP DHP (DHP/CB/B) 8260 List 1; TPHd 8260 List 1; TPHd 8260 List 1; TPHd ANALYTES w/SGC w/SGC w/SGC **DTW ONLY** DTW ONLY TOTAL 1,53 22

DHP=DOWN HOLE PUMP CB=CHECK BALL B=BAILER FD=FIELD DUPLICATE MB=METHOD BLANK FF=FIELD FILTERED

2009

9000

9000



21 West Fourth Street, Eureka, CA 95501

TEL 707.443.5054 FAX 707.443.0553

											Page 2 of 2
	Project						Tech:	SJD	,		
			tem Pole	Market		Mob/	Demob time:	, 25,	<u>/.25</u>		
	Project No.:										
		5-2-0					Time on site:	12:50			
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	Ecw (pmohs)  Ecw (Vm) 9RP (mV)										1000
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	WELL CONDITION	9001									
	WASTE DRUMS										

FAX 707.443.0553

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NORTH COAST	LABORATORIES LTD.	5680 West End Road • Arcata • CA 95521-9202 707-872-4849 Fax 707-872-4831
E	五五五	Y

# Chain of Custody

LABORATORY NUMBER:

of

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		EVIL	TAT: \$\Begin{array}{c} 24 \text{ Hr}  \Beta 48 \text{ Hr}  \Beta 5 \text{ Day}  \Beta 5-7 \text{ Day}
Attention: David Gervan		VAV	(7 STD (2–3 Wk) 🗆 Other:
esults & Invoice to: Laco Associates		ES	
Address: 21 W. 4th St. Eureka CA 95501		d 	PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES
		283	DEPOPTINIC DECLIBEMENTS. State Forms
Hone: (707) 443-5054		NIV	
Topics of Deport to: Ms Valerie Filis			
1000	00.40	<i>L</i> 6	Final Report: FAX □ Verbal □ By:
rorks Estate F.O. Box 1092 Kodiak, AK 99615 (907) 486-2042	-7047		
Sampler (Sign & Print): SJD			CONTAINER CODES: 1—1/2 gal. pl; 2—250 ml pl;
PROIECT INFORMATION		SI	5—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA;
	According to the fact of the f	SA	10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar;
Project Number: 3472.04		Ţ	13—brass tube; 14—other
Project Name: Totem Pole Market		181	PRESERVATIVE CODES: a—HNO <sub>3</sub> ; b—HCl; c—H <sub>2</sub> SO <sub>4</sub> ;
Purchase Order Number: TASK- 3023		m pj T10	d—Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ; e—NaOH; f—C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> CI; g—other
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,	IIME MAIKIX		
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51.7	) / mas	) 9/	
*			1
			SHIPPED VIA: UPS Air-tx Fed-tx Bus Hand

# ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

<sup>\*</sup>MATRIX: DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

## Attachment 3

May 11, 2005

LACO Associates P.O. Box 1023 Eureka, CA 95502

Attn: David Gervan

RE: 3472.04, Totem Pole Market

# MAY 1 2 2005 BY: JG



Order No.:

0505025

Invoice No.:

50012

PO No.:

**TASK-3023** 

ELAP No. 1247-Expires July 2006

### SAMPLE IDENTIFICATION

Client Sample Description	
3472-MW1-W	
3472-MW1-W	
3472-MW4S-W	
3472-MW4S-W	
3472-MW4D-W	
3472-MW4D-W	
3472-MW5-W	
3472-MW5-W	
3472-QCTB-W	
	3472-MW1-W 3472-MW1-W 3472-MW4S-W 3472-MW4S-W 3472-MW4D-W 3472-MW4D-W 3472-MW5-W

ND = Not Detected at the Reporting Limit

Limit = Reporting Limit

All solid results are expressed on a wetweight basis unless otherwise noted.

REPORT CERTIFIED BY

Laboratory Supervisor(s)

QA Unit

Jesse G. Chaney, Jr. Laboratory Director

L (doMana

### North Coast Laboratories, Ltd.

CLIENT:

LACO Associates

Project:

3472.04, Totem Pole Market

Lab Order:

0505025

**CASE NARRATIVE** 

**Date:** 11-May-05

All samples submitted for a silica gel cleanup were initially analyzed for diesel. The samples showing no detectable levels of the analyte were not subjected to the cleanup procedure.

### TPH as Diesel with Silica Gel Cleanup:

Sample 3472-MW1-W contains some material lighter than diesel, and material in the diesel range of molecular weights, but the material does not exhibit the peak pattern typical of diesel oil.

The surrogate recovery for sample 3472-MW1-W was outside of the acceptance limits. The surrogate recoveries for the quality control samples were within the acceptance limits. This indicates that the low surrogate recovery may be due to matrix effects from the sample.

### Gasoline Components/Additives:

Sample 3472-MW1-W does not present a peak pattern consistent with that of gasoline. The reported result represents the amount of material in the gasoline range.

The surrogate recovery for sample 3472-MW1-W was outside of the acceptance limits. The surrogate recoveries for the quality control samples were within the acceptance limits. This indicates that the low surrogate recovery may be due to matrix effects from the sample.

11-May-05

WorkOrder: 0505025

ANALYTICAL REPORT

Client Sample ID: 3472-MW1-W

Received: 5/2/05

Collected: 5/2/05 0:00

**Lab ID:** 0505025-01A

Matrix: Groundwater

Test Name:	Gasoline Components/Additives	Reference: LUF	T/EPA 8260B Modified
------------	-------------------------------	----------------	----------------------

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
Methyl tert-butyl ether (MTBE)	ND	1.0	μg/L	1.0		5/4/05
Tert-butyl alcohol (TBA)	ND	10	μg/L	1.0		5/4/05
Di-isopropyl ether (DIPE)	4.1	1.0	μg/L	1.0		5/4/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	μg/L	1.0		5/4/05
Benzene	0.66	0.50	μg/L	1.0		5/4/05
Tert-amyl methyl ether (TAME)	ND	1.0	μg/L	1.0		5/4/05
Toluene	ND	0.50	μg/L	1.0		5/4/05
Ethylbenzene	2.9	0.50	μg/L	1.0		5/4/05
m,p-Xylene	0.62	0.50	μg/L	1.0		5/4/05
o-Xylene	ND	0.50	μg/L	1.0		5/4/05
Surrogate: 1,4-Dichlorobenzene-d4	73.1	80.8-139	% Rec	1.0		5/4/05

Test Name: TPH as Gasoline Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<b>Extracted</b>	<b>Analyzed</b>
TPHC Gasoline	3,200	50	μg/L	1.0		5/4/05

Client Sample ID: 3472-MW1-W Received: 5/2/05 **Collected:** 5/2/05 0:00

**Lab ID:** 0505025-01D Matrix: Groundwater

Test Name: TPH as Diesel with Silica Gel Cleanup Reference: EPA 3510/3630/GCFID(LUFT)/8015B

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<b>Extracted</b>	<b>Analyzed</b>
TPHC Diesel (C12-C22)	330	50	μg/L	1.0	5/5/05	5/9/05
Surrogate: N-Tricosane	66.7	70-130	% Rec	1.0	5/5/05	5/9/05

11-May-05

WorkOrder: 0505025

ANALYTICAL REPORT

Client Sample ID: 3472-MW4S-W

Received: 5/2/05

Collected: 5/2/05 0:00

**Lab ID:** 0505025-02A

Matrix: Groundwater

nents/Additives

Reference:	LUFT/EPA	8260B	Modified	

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
Methyl tert-butyl ether (MTBE)	ND	1.0	μg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	μg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	μg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	μg/L	1.0		5/3/05
Benzene	ND	0.50	μg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	μg/L	1.0		5/3/05
Toluene	ND	0.50	μg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	μg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	μg/L	1.0		5/3/05
o-Xylene	ND	0.50	μg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	88.8	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline

Reference:	LUFT/EPA	8260B M	odified
Reference	LUT I/EPA	OZOUD IVI	oamea

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
TPHC Gasoline	ND	50	μg/L	1.0		5/3/05

Client Sample ID: 3472-MW4S-W

Received: 5/2/05

**Collected:** 5/2/05 0:00

**Lab ID:** 0505025-02D

Matrix: Groundwater

Test Name: TPH as Diesel

Reference: EPA 3510/GCFID(LUFT)/EPA 8015B

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
TPHC Diesel (C12-C22)	ND	50	μg/L	1.0	5/4/05	5/4/05
Surrogate: N-Tricosane	95.4	70-130	% Rec	1.0	5/4/05	5/4/05

11-May-05

WorkOrder: 0505025

ANALYTICAL REPORT

Client Sample ID: 3472-MW4D-W

**Received:** 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-03A

Matrix: Groundwater

Test Name: Gasoline Components/Additives Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<b>Extracted</b>	<b>Analyzed</b>
Methyl tert-butyl ether (MTBE)	ND	1.0	μg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	μg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	μg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	μg/L	1.0		5/3/05
Benzene	ND	0.50	μg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	μg/L	1.0		5/3/05
Toluene	ND	0.50	μg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	μg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	μg/L	1.0		5/3/05
o-Xylene	ND	0.50	μg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	87.9	80.8-139	% Rec	1.0		5/3/05

Reference: LUFT/EPA 8260B Modified Test Name: TPH as Gasoline

<u>Limit</u> DF **Extracted Analyzed** Parameter Result Units 5/3/05 ND 50 μg/L 1.0 **TPHC** Gasoline

Client Sample ID: 3472-MW4D-W

Received: 5/2/05

Collected: 5/2/05 0:00

Lab ID: 0505025-03D

Matrix: Groundwater

Test Name: TPH as Diesel Reference: EPA 3510/GCFID(LUFT)/EPA 8015B

 $\underline{\mathbf{DF}}$ **Extracted** Result <u>Limit</u> Units **Analyzed Parameter** μg/L 1.0 5/4/05 5/4/05 TPHC Diesel (C12-C22) ND 50 70-130 5/4/05 5/4/05 Surrogate: N-Tricosane 90.6 % Rec 1.0

11-May-05

WorkOrder: 0505025

ANALYTICAL REPORT

Client Sample ID: 3472-MW5-W

Received: 5/2/05

**Collected:** 5/2/05 0:00

Lab ID: 0505025-04A

Matrix: Groundwater

Test Name:	Gasoline Components/Additives	Reference: LUFT/EPA 8260B Modified
------------	-------------------------------	------------------------------------

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
Methyl tert-butyl ether (MTBE)	ND	1.0	μg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	μg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	μg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	μg/L	1.0		5/3/05
Benzene	ND	0.50	μg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	μg/L	1.0		5/3/05
Toluene	ND	0.50	μg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	μg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	μg/L	1.0		5/3/05
o-Xylene	ND	0.50	μg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	88.7	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
TPHC Gasoline	ND	50	μg/L	1.0		5/3/05

Client Sample ID: 3472-MW5-W Received: 5/2/05 Collected: 5/2/05 0:00

Lab ID: 0505025-04D Matrix: Groundwater

Test Name: TPH as Diesel Reference: EPA 3510/GCFID(LUFT)/EPA 8015B

<u>DF</u> **Parameter** Result **Limit** <u>Units</u> **Extracted Analyzed** TPHC Diesel (C12-C22) ND 50 μg/L 1.0 5/4/05 5/5/05 Surrogate: N-Tricosane 96.8 70-130 % Rec 1.0 5/4/05 5/5/05

11-May-05

WorkOrder: 0505025

ANALYTICAL REPORT

Client Sample ID: 3472-QCTB-W

Received: 5/2/05

Collected: 5/2/05 0:00

**Lab ID:** 0505025-05A

Matrix: Trip Blank

Test Name: Gasoline Components/Additives Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
Methyl tert-butyl ether (MTBE)	ND	1.0	μg/L	1.0		5/3/05
Tert-butyl alcohol (TBA)	ND	10	μg/L	1.0		5/3/05
Di-isopropyl ether (DIPE)	ND	1.0	μg/L	1.0		5/3/05
Ethyl tert-butyl ether (ETBE)	ND	1.0	µg/L	1.0		5/3/05
Benzene	ND	0.50	μg/L	1.0		5/3/05
Tert-amyl methyl ether (TAME)	ND	1.0	μg/L	1.0		5/3/05
Toluene	ND	0.50	μg/L	1.0		5/3/05
Ethylbenzene	ND	0.50	μg/L	1.0		5/3/05
m,p-Xylene	ND	0.50	μg/L	1.0		5/3/05
o-Xylene	ND	0.50	μg/L	1.0		5/3/05
Surrogate: 1,4-Dichlorobenzene-d4	88.5	80.8-139	% Rec	1.0		5/3/05

Test Name: TPH as Gasoline Reference: LUFT/EPA 8260B Modified

<u>Parameter</u>	Result	<u>Limit</u>	<u>Units</u>	$\overline{\mathbf{DF}}$	<b>Extracted</b>	<b>Analyzed</b>
TPHC Gasoline	ND	50	ua/L	1.0		5/3/05

# North Coast Laboratories, Ltd.

LACO Associates CLIENT:

0505025 Work Order:

3472.04, Totem Pole Market Project:

Method Blank

QC SUMMARY REPORT

**Date:** 11-May-05

Sample ID MB-5/3/05 Client ID:	Batch ID: <b>R34720</b>	Test Code: Run ID:	Test Code: <b>8260OXYW</b> Units: Run ID: <b>ORGCMS2_050503B</b>	Units: µg/L 50503B		Analysis SeqNo:	Analysis Date 5/3/05 9:14:00 AM SeqNo: 503088	14:00 AM	Prep Date	Φ	
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	LowLimit HighLimit RPD Ref Val	D Ref Val	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	ON C	1.0							The state of the s		
Di-isopropyl ether (DIPE)	2 2	1.0									
Ethyl tert-butyl ether (ETBE)	QN	1.0									
Benzene	QN	0.50									
Tert-amyl methyl ether (TAME)	QN	1.0									
Toluene	0.1712	0.50									7
Ethylbenzene	0.1741	0.50									7
m,p-Xylene	0.2467	0.50									7
o-Xylene	0.2322	0.50									7
1,4-Dichlorobenzene-d4	0.869	0.10	1.00	0	86.9%	81	139	0			
Sample ID MB-5/3/05	Batch ID: R34719	Test Code:	Test Code: GASW-MS	Units: µg/L		Analysis	Analysis Date 5/3/05 9:14:00 AM	14:00 AM	Prep Date	O)	
Client ID:		Run ID:	ORGCMS2_050503A	50503A		SeqNo:	503071				
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	LowLimit HighLimit RPD Ref Val	D Ref Val	%RPD	RPDLimit	Qual
TPHC Gasoline	19.98	20									7
Sample ID MB-13454	Batch ID: 13454	Test Code:	Test Code: SGTPHDW UR	Units: µg/L		Analysis SegNo:	Analysis Date 5/9/05 3:57:34 PM	57:34 PM	Prep Dat	Prep Date <b>5/5/05</b>	
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	LowLimit HighLimit RPD Ref Val	D Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22) N-Tricosane	29.24 45.9	0.10	50.0	0	91.8%	70	130	0			, ·

ND - Not Detected at the Reporting Limit Qualifiers:

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

B - Analyte detected in the associated Method Blank

R - RPD outside accepted recovery limits

LACO Associates 0505025 CLIENT:

Work Order:

3472.04, Totem Pole Market

Project:

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Method Blank

0.000	Dotob ID: 49446	Took Oode:	And Hotel	1,000		Applycia	Applying Data 514105 6:44-06 DM		Drep Date 6/4/05	5/4/05	
Sample ID MB-13440	Dalcii I.D. 13446	est code.	code. Irabiw oillis. pg/L	OHIS: PUSIT		Alialysis	Date 3/4/03 0.44.00 F		במוני	507	
Client ID:		Run ID:	ORGC7_050504B	04B		SeqNo:	503358				
Analyte	Result	Limit	Limit SPK value SPK Ref Val	SPK Ref Val	% Rec	LowLimit	% Rec LowLimit HighLimit RPD Ref Val	Ü	<del>Б</del>	%RPD RPDLimit Qual	Qual
TPHC Diesel (C12-C22)	N	20	make and place and the same and				THE CONTROL OF THE CO				
N-Tricosane	43.6	0.10	50.0	0	87.2%	20	130	0			

ND - Not Detected at the Reporting Limit Qualifiers: J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

B - Analyte detected in the associated Method Blank

R - RPD outside accepted recovery limits

# North Coast Laboratories, Ltd.

LACO Associates CLIENT:

0505025 Work Order: Project:

3472.04, Totem Pole Market

Laboratory Control Spike QC SUMMARY REPORT

**Date:** 11-May-05

Sample ID 1 CS_05304		Ratch ID: <b>D3/1700</b>	Tect Code.	WXXUUS .	l loite: 110/1		Analysis	Date 5/3/0	Analysis Date 5/3/05 5:11:00 AM	Pren Date	d.	
Client ID:			Run ID:	ORGCMS2 050503B	150503B		SeaNo:	503085	5	i l l	}	
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	(MTBE)	T879	1.0	20.0	0	94.0%	80	120	0			No. of Concession, Spinster, Spinste
Tert-butyl alcohol (TBA)	· · ~	353.8	10	400	0	88.5%	25	162	0			
Di-isopropyl ether (DIPE)	Ĕ)	19.03	1.0	20.0	0	95.2%	80	120	0			
Ethyl tert-butyl ether (ETBE)	ETBE)	18.81	1.0	20.0	0	94.1%	11	120	0			
Benzene		19.68	0.50	20.0	0	98.4%	78	117	0			
Tert-amyl methyl ether (TAME)	· (TAME)	19.90	1.0	20.0	0	99.5%	29	136	0			
Toluene		18.68	0.50	20.0	0	93.4%	80	120	0			
Ethylbenzene		20.37	0.50	20.0	0	102%	80	120	0			
m,p-Xylene		40.68	0.50	40.0	0	102%	80	120	0			
o-Xylene		20.31	0.50	20.0	0	102%	80	120	0			
1,4-Dichlorobenzene-d4	4	1.12	0.10	1.00	0	112%	81	139	0			
Sample ID LCSD-05304	304	Batch ID: <b>R34720</b>	Test Code:	8260OXYW	Units: µg/L		Analysis Date	Date 5/3/0	5/3/05 5:42:00 AM	Prep Date	ate	
Client ID:			Run ID:	ORGCMS2_050503B	)50503B		SeqNo:	503086	9			
Analyte		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Methyl tert-butyl ether (MTBE)	(MTBE)	19.06	1.0	20.0	0	95.3%	80	120	18.8	1.42%	20	
Tert-butyl alcohol (TBA)	(F	358.5	10	400	0	89.6%	25	162	354	1.31%	20	
Di-isopropyl ether (DIPE)	λE)	19.04	1.0	20.0	0	95.2%	80	120	19.0	0.0206%	20	
Ethyl tert-butyl ether (ETBE)	ETBE)	18.74	1.0	20.0	0	93.7%	77	120	18.8	0.389%	20	
Benzene		19.39	0.50	20.0	0	%0.76	78	117	19.7	1.47%	20	
Tert-amyl methyl ether (TAME)	(TAME)	20.30	1.0	20.0	0	101%	9	136	19.9	2.00%	20	
Toluene		18.66	0.50	20.0	0	93.3%	80	120	18.7	0.0793%	20	
Ethylbenzene		19.85	0.50	20.0	0	99.3%	80	120	20.4	2.58%	20	
m,p-Xylene		40.17	0.50	40.0	0	100%	80	120	40.7	1.26%	20	
o-Xylene		20.25	0.50	20.0	0	101%	80	120	20.3	0.319%	20	
1,4-Dichlorobenzene-d4	45	1.14	0.10	1.00	0	114%	8	139	1.12	2.26%	20	
Qualifiers: NE	D - Not Detec	ND - Not Detected at the Reporting Limit		ds - Sp	S - Spike Recovery outside accepted recovery limits	le accepted rec	overy limits	B	B - Analyte detected in the associated Method Blank	in the associate	ed Method Bla	nk
100	Analyte dete	J - Analyte detected below quantitation limits	nits	R - R	R - RPD outside accepted recovery limits	l recovery limi	SJ.					

QC SUMMARY REPORT

Laboratory Control Spike

3472.04, Totem Pole Market Work Order: Project:

0505025

LACO Associates

CLIENT:

Sample ID LCS-05305	Batch ID: <b>R34719</b>	lest Code:	lest Code: GASW-MS	Units: <b>µg/L</b>		Anaiysis	Uate 5/3/0:	Analysis Date 5/3/05 /:13:00 AM	Frep Date	1)	
Client ID:		Run ID:	ORGCMS2_050503A	50503A		SedNo:	503068	œ			
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gasoline	1,11	20	1,000	0	111%	80	120	0	Market and the state of the sta		4
Sample ID LCSD-05305	Batch ID: <b>R34719</b>	Test Code:	GASW-MS	Units: µg/L		Analysis	Date 5/3/0	Analysis Date 5/3/05 7:43:00 AM	Prep Date	0	
Client ID:		Run ID:	ORGCMS2_050503A	50503A		SeqNo:	503069	6			
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gasoline	1,105	20	1,000	0	111%	80	120	1,110	0.523%	20	
Sample ID LCS-13454	Batch ID: 13454	Test Code:	SGTPHDW	Units: µg/L		Analysis	Date 5/9/0	Analysis Date 5/9/05 2:01:46 PM	Prep Date	e <b>5/2/05</b>	
Client ID:		Run ID:	ORGC5_050509A	909A		SeqNo:	504021	-			
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)	453.5	20	200	0	90.7%	40	107	0	ALAKAN AND AND AND AND AND AND AND AND AND A		
N-Tricosane	53.6	0.10	50.0	0	107%	70	130	0			
Sample ID LCSD-13454	Batch ID: 13454	Test Code:	Test Code: SGTPHDW	Units: µg/L		Analysis	Date 5/9/0	Analysis Date 5/9/05 2:31:11 PM	Prep Date <b>5/5/05</b>	e 5/2/05	
Client ID:		Run ID:	ORGC5_050509A	V609		SeqNo:	504022	2			
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)	418.5	20	200	0	83.7%	40	107	454	8:03%	15	
N-Tricosane	52.9	0.10	50.0	0	106%	20	130	53.6	1.27%	15	
Sample ID LCS-13446	Batch ID: 13446	Test Code: TPHDIW	TPHDIW	Units: µg/L		Analysis	Date 5/4/0	Analysis Date 5/4/05 5:10:15 PM	Prep Date 5/4/05	e 5/4/05	
Client ID:		Run ID:	ORGC7_050504B	304B		SeqNo:	503355	ž,			
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)	487.6	20	200	0	97.5%	29	120	0	And the second s		THE RESIDENCE OF THE PARTY OF T
N-Tricosane	50.5	0.10	20.0	0	101%	20	130	0			
The state of the s			A CHARLES OF THE CASE OF THE C								
Qualifiers: ND - Not De	ND - Not Detected at the Reporting Limit		S - Sp	S - Spike Recovery outside accepted recovery limits	accepted rec	overy limits	В	B - Analyte detected in the associated Method Blank	n the associated	l Method Blar	¥

R - RPD outside accepted recovery limits

J - Analyte detected below quantitation limits

LACO Associates CLIENT:

0505025 Work Order:

3472.04, Totem Pole Market

Project:

QC SUMMARY REPORT

Laboratory Control Spike Duplicate

Sample ID LCSD-13446	Batch ID: 13446	Test Code: TPHDIW	TPHDIW	Units: µg/L		Analysis	Analysis Date 5/4/05 5:29:14 PM	14 PM	Prep Da	Prep Date 5/4/05	
Client ID:		Run ID:	ORGC7_050504B	04B		SeqNo:	503356				
Analyte	Result	Limit	SPK value	SPK value SPK Ref Val	% Rec	LowLimit	LowLimit HighLimit RPD Ref Val	Ref Val	%RPD	RPDLimit	Qual
TPHC Diesel (C12-C22)	501.7	20	200	0	100%	29	120	488	2.85%	15	
N-Tricosane	51.1	0.10	50.0	0	102%	20	130	50.5	1.21%	15	

ND - Not Detected at the Reporting Limit

Qualifiers:

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

B - Analyte detected in the associated Method Blank

R - RPD outside accepted recovery limits

NORTH COAST	(LABORATORIES LTD.	5680 West End Road • Arcata • CA 95521-9202 707-822-4649 Fax 707-822-6831
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99615 (907) 486-2042 CONTAINS SISSIS	
Kodiak, AK 99615 (907) 486-2042	REPORTING REQUIREMENTS: State Forms □  Preliminary: FAX K Verbal □ By:  Final Report: FAX □ Verbal □ By:
LYSIS	CONTAINER CODES: 1—1/2 gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA;
DS/w b	10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other  PRESERVATIVE CODES: a—HNO;; b—HCl; c—H,SO,; d—Na,So,; e—NaOH; f—C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> Cl; g—other
DATE TIME MATRIX* 88260  \$ 5.2-05 PM GW  3 1  3 1	SAMPLE CONDITION/SPECIAL INSTRUCTIONS GEOTRACKER
3472-MW45-W 3472-MW5-W 3472-QCTB-W 4 V 7 V 7 V 7 V 7 V 7 V 7 V 7 V 7 V 7 V 7	
AN MAN	3 de mars
RECEIVED BY (Sign & Print) DATE/TIME RECEIVED BY (Sign) DATE/TIME SAMPLE DISPOSAL  STEVE DAVIS 5-2-05 A Common Sign Serving Serving Sign Serving Ser	SAMPLE DISPOSAL  I NCL Disposal of Non-Contaminated  I Return  CHAIN OF CHETORY SEALS Y/N/NA FERENCE

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CHAIN OF CUSTODY SEALS Y/N/NA SHIPPED VIA: UPS Air-Ex Fed-Ex B

# ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

<sup>\*</sup>MATRIX: DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

## Attachment 4

### LACO ASSOCIATES

### STANDARD OPERATING PROCEDURE No. 1 (revised September 2002) Hazardous Materials Investigation Procedures

SCOPE	
PREPARATION AND COMPLETION	3
Pre-field Activities	
Mobilization and Site Arrival	
Demobilization	
GENERAL METHODOLOGIES	5
Decontamination	5
Waste Storage and Characterization	5
Borehole Logging	
SAMPLE COLLECTION AND HANDLING	
Surface Water	
Groundwater	
Soils	
Sample Coordination	
DRILLING FOR SUBSURFACE INVESTIGATION AND MONIT	
INSTALLATION	
Rotary Drilling	
Direct Push	
Hand Auger	
MONITORING WELL DEVELOPMENT AND SURVEYING	
Monitoring Well Development	
Wellhead Surveying	
REFERENCES	
LIST OF FIGURES	
LIST OF ATTACHMENTS	·····

### SCOPE

Standard Operating Procedures (SOP) No.1 is for the implementation of hazardous material investigation procedures including pre-site activities, field methodologies, and post-field work activities. Monitoring well sampling is covered in SOP No.2. SOP No.1 will be used by HAZWOPER-certified personnel in conjunction with the drilling file provided by the Project Manager to complete the required tasks in a consistent and standardized manner. Each section covers a specific task. Where multiple tasks are involved, refer to the appropriate section(s).

SOP No.1 will be reviewed annually through a systematic evaluation by Environmental Department personnel. If revised, an updated SOP will be published and forwarded to the appropriate regulatory agencies and personnel by January 31 of each new year.

### PREPARATION AND COMPLETION

### **Pre-field Activities**

The Project Manager will initiate the project by starting a drilling file, which ensures all pre and post drilling tasks are completed and details the proposed field activities (Attachment 1). The purpose of the drilling file is to facilitate efficient transfer of information and responsibility from the Project Manager (PM) to the Field Geologist and back to the PM upon completion of work. The drilling file will include the following information:

- 1. Copies of the workplan, approval letter, access agreements, and encroachment and drilling permits
- 2. USA and owner/tenant clearances
- 3. Order of work
- 4. List of supplies necessary for the installation
- 5. Timeline, budget, and allocation of resources
- 6. Site safety and health plan specifying personal protection equipment (PPE) anticipated for the project

The Project Manager establishes and ensures task due dates are met. The Field Geologist will direct the order of work and is ultimately responsible for the collection and recording of all field data.

### **Mobilization and Site Arrival**

Mobilization and site arrival covers the assembling of equipment and crew necessary for a particular project through implementation of the workplan at the project site.

- 1. Verify that equipment and supplies are present. Load drill rig or Geoprobe as applicable
- 2. Travel to site and notify site owner/operator of start of work
- 3. Field Geologist will hold tailgate safety meeting and complete a Field Safety Meeting form (Attachment 2)
- 4. Set up orange cones and "Closed Sidewalk" signs, as appropriate, and secure work area
- 5. Establish decontamination station, as appropriate

The Field Geologist is responsible for briefing the crew on relevant safety measures during the tailgate safety meeting. This shall take place on the first day of a project, whenever safety conditions change, when new crew members start work on the project, and at intervals of 10 days for long-term continuous projects.

#### **Demobilization**

Demobilization consists primarily of returning the drill rig, Geoprobe, support vehicle, and any other equipment used in the course of a project back to pre-implementation condition. The Laboratory Manager or Vice President of Operations shall be notified of any non-disposable equipment lost or damaged during a project. Post implementation elements of the drilling file shall be completed by the Field Geologist and returned to the Project Manager when fieldwork for that phase of the project has been completed. The following shall be added to the drilling file prior to returning it to the Project Manager:

- 1. Boring and well construction logs
- 2. Field notes and drawings
- 3. Equipment and supply billing forms
- 4. Completed chain-of-custody for analytical laboratory samples
- 5. Brief written summary of work performed
- 6. Two copies of the Field Safety Meeting forms; original to the safety officer and one copy to the Project Manager

#### GENERAL METHODOLOGIES - DRILLING

The following descriptions of work methods cover general tasks associated with drilling and sample collection.

#### **Decontamination**

The majority of projects will not require the use of multiple decontamination zones. Separate wash and rinse tubs are adequate for most projects. The Project Manager will indicate in the order of work section of the drilling file if additional decontamination is required.

Sampling equipment will be decontaminated using an Alconox detergent spray with a clean water rinse. Drill bits and rods, augers, and rig tools shall be pressure washed, steam cleaned, or scrubbed with the Alconox and rinsed before and after use. Alconox and clean rinse water will be pumped through each low flow submersible pump prior to its use. Down-hole equipment shall never be lubricated with petroleum-based lubricants.

#### Waste Storage and Characterization

#### **Storage**

- 1. Soil cuttings will be immediately secured in DOT-approved 55-gallon steel drums, sealed, and marked according to contents, boring of origin, and date of first accumulation, or may be added to an existing stockpile as approved by the Project Manager.
- 2. Purge water and equipment rinsate will be immediately secured in DOT-approved 55-gallon steel drums, sealed, and marked according to contents, boring of origin, and date of first accumulation.
- 3. Soil and water storage drums shall only be stored on-site, in a secure location provided by the client.
- 4. Free-phase gasoline or other hazardous material will be double contained in accordance with 40 CFR 264.175 (1993) in a secure location on-site, provided by the client.
- 5. Storage of soil known or suspected to qualify as designated or hazardous waste shall conform to the requirements of the Oversight Agency. At a minimum, soil shall be stockpiled on 10-mil PVC sheeting and shall be securely covered with 10-mil sheeting during wet weather periods.

#### Characterization

Characterization samples will be collected from each drum of wastewater, with methods appropriate for the necessary tests. Samples will be collected using a disposable bailer from the center of the water in the drum.

Samples from soil drums shall be composited by the laboratory in a ratio of 4 drums per 1 sample for analysis. Samples will be collected out of the approximate center of the soil in the drum. However, sampling technique will depend on the required analyses.

#### **Borehole Logging**

A complete log will be maintained when soils are encountered during drilling operations (Attachment 3). A State of California Registered Geologist will review the completed log. Soils will be classified in accordance with ASTM D-2488 (Standard Practice for Description and Identification of Soils [Visual-Manual Procedure]). The Field Geologist will record the following data in the log:

- 1. Based on auger cuttings or soil samples, record visual-manual estimate of grain size percentages (sand, gravel, silt, clay) and describe the soil texture according ASTM D-2488.
- 2. Record color (Munsell), moisture, density, plasticity, and percent organics.
- 3. Note any hydrocarbon odor, staining, or sheen.
- 4. Record depth(s) to saturated soil(s).
- 5. Record Photoionization Detector (PID) results from bagged grab samples, if applicable.
- 6. If collecting samples by split-spoon, record SPT blow counts for every 0.5-foot penetration of the split-spoon sampler, driven by a standard 140-pound weight falling a standard distance.
- 7. Sampling depth(s) and methodologies.
- 8. Identify samples by sample ID (project number-boring number-depth-matrix), field point name (project number-boring number), and date.
- 9. Record monitoring well construction specifications or closure date and sealing material(s) for temporary borings.

#### SAMPLE COLLECTION AND HANDLING

Refer to the Workplan and drilling file for the analytical suite, and to the laboratory for appropriate sample containers.

#### **Surface Water**

- 1. Submerge a clean stainless steel dipper (or other suitable device) with minimal surface disturbance, allow the device to fill slowly and continuously, and retrieve the dipper/device from the surface water with minimal disturbance.
- 2. Remove the cap from the appropriate sample bottle provided by the laboratory and slightly tilt the mouth of the bottle below the dipper/device edge. Empty the dipper/device slowly, allowing the sample stream to flow gently down the inside of the bottle with minimal entry turbulence. Check that a Teflon septum is present in the cap, if required. Secure the cap tightly. When filling VOAs, ensure that no air is trapped inside the bottle by inverting and tapping. If any bubbles are observed, repeat the procedure.
- 3. Label the sample bottle with an appropriate sample tag. Be sure to label the tag carefully, legibly and clearly, addressing all the categories. Record sample information in field notes and complete a chain-of-custody form (Attachment 4).
- 4. Place the properly labeled sample bottle in a cooler maintained at 4°C throughout the sampling and transportation period.

#### Groundwater

General procedures to be followed for sampling groundwater from a cased boring or hydropunch or screen point sampler:

- 1. Slowly lower bailer or pump into casing, do not drop.
- 2. Allow bailer or pump to fill.
- 3. Retrieve bailer or begin pumping.
- 4. Remove the cap from the appropriate sample bottle provided by the laboratory and slightly tilt the mouth of the bottle below the bailer or pump outlet. Fill the sample container slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence. Check that a Teflon septum is present in the cap, if required. Secure the cap tightly. When filling VOAs, ensure that no air is trapped inside the bottle by inverting and tapping. If any bubbles are observed, repeat the procedure.
- 5. Place the properly labeled sample bottle in a cooler maintained at 4°C throughout the sampling and transportation period.

#### Soils

- 1. Place clean sample container on clean surface.
- 2. Place soil into appropriate sample container.
- 3. For samples contained in a brass tube, cap each end with Teflon tape or aluminum foil and a plastic cap.
- 4. Place the properly labeled sample container in a cooler maintained at 4°C throughout the sampling and transportation period.

#### **Sample Coordination**

Review chain-of-custody and submit samples to laboratory upon return from the field. Alternate arrangements shall be made if sample holding times will expire before fieldwork is completed. Soil samples do not require additional packaging during transport; however, liquid samples should be packaged securely.

# DRILLING FOR SUBSURFACE INVESTIGATION AND MONITORING WELL INSTALLATION

Refer to the drilling file for drilling method(s), sampling depth(s), sampling method(s), and monitoring well construction specifications. The drill rig operator shall possess, or work for a company that possesses, a valid, current C-57 Well Driller's License. Installation, construction, and closure of borings and monitoring wells shall be in accordance with Bulletins 74-81 and 74-90, California. Variations from the California Well Standards must be authorized by the Oversight Agency, in advance. Rotary and direct push drilling procedures are discussed. General borehole logging and sample handling procedures are outlined in the General Methodologies Section.

#### **Rotary Drilling**

Rotary drilling uses flighted augers to remove soil from a borehole. The purpose is to advance a borehole to a designated depth from which a sampler will be utilized to collect soil or groundwater samples, or install a casing to hold a borehole open. Augers are typically constructed in 5-foot lengths of heavy-duty steel that connect together. Caution is advised when lifting heavy equipment. Hollow stem augers are open in the middle and solid are not. Solid flight augers are generally used in cohesive soils. Non-cohesive soils require the use of hollow stem augers.

#### Solid Flight Augers

Augers are advanced to the required depth and removed, then a soil sampler or casing is lowered into in the borehole.

#### Soil Sampling

A soil sampler connected to drill rod(s) is advanced to the specified depth and retrieved. A steel split-spoon or push tube is used to collect soil samples (Figure 1).

- 1. Lift augers out of borehole and insert clean split-spoon or push tube sampler.
- 2. The split spoon is attached to heavy-duty drill-rods and the push tube to light weight rods.
- 3. Lower the assembly into the borehole.
- 4. Attach a slide hammer to the rods.
- 5. Without lifting the rods, advance the sampler to the specified depth.
- 6. Retract the rods to the starting depth and disconnect the slide hammer.
- 7. Attach a lifting nipple to the rods and retract the sampler.
- 8. Remove the soil from the sampler in a clean work area.

9. Follow soil sample collection and handling procedures.

#### Groundwater Sampling

A well screen is installed to the specified depth for the retrieval of groundwater grab samples and recording of depth to water measurements (Figure 2). A bailer or bottom tubing check ball pump is typically used to collect groundwater samples.

#### Temporary Screening Well Construction

- 1. Using new clean PVC pipe, saw-cut slots over the desired screen interval (typically 5 feet).
- 2. Place a cap on each end.
- 3. With the slotted end down, insert pipe to bottom of borehole.
- 4. If the boring is to be left overnight, or if it may receive surface runoff, place a bridge to a depth of 1 foot around the pipe followed by a bentonite seal.

#### Groundwater Collection

- 1. Slowly lower the specified sampling device to approximately one foot above the bottom of the casing to minimize the amount of sediment collected in the groundwater sample.
- 2. Follow groundwater sample handling and collection procedures.

#### Hollow Stem Augers

Hollow Stem Augers are used to prevent a borehole from collapsing during sample collection or well installation. Augers are advanced to the required depth and the drill rods are removed. A soil or hydropunch sampler is then be lowered down the hollow augers. When a continuous soil core is desired, a core barrel positioned inside the augers is simultaneously advanced to the specified depth. The augers function as a centralizer during placement of well casing and as a tremmie pipe during the placement of the annular materials.

#### Soil Sampling

A soil sampler connected to drill rod(s) is lowered through the augers or advanced with the augers to the specified depth and retrieved (Figure 3).

- 1. Attach a clean push tube or split-spoon to the drill rods.
- 2. The push tube is attached to light weight rods and the split spoon to heavy-duty drill rods.
- 3. Lower the assembly into the borehole through the hollow stem augers.
- 4. Attach a slide hammer to the drill rods.
- 5. Without lifting the rods, advance the sampler to the specified depth.

- 6. Retract the rods to the starting depth and disconnect the slide hammer.
- 7. Attach a lifting nipple to the rods and retract the sampler.
- 8. In a clean work area remove the soil from the sampler.
- 9. Follow soil sample handling and collection procedures.

#### Hydropunch Sampling

A groundwater sampler connected to drill rod(s) is lowered through the augers, advanced to the specified depth and retracted to expose the sampler to the aquifer (Figure 4).

- 1. Assemble a clean hydropunch sampler with new slotted casing and expendable drive point. Check and replace damaged o-ring seals. Position a gouch tube over the shoe and drive point ensuring the point remains tightly against the shoe.
- 2. Attach the hydropunch sampler to the drill rods. Teflon tape should be placed on the threads.
- 3. Lower the assembly into the borehole through the hollow stem augers.
- 4. Attach the slide hammer to the drive rods.
- 5. Without lifting the drive rods, advance the assembly to the specified depth.
- 6. Retract the drive rods to the specified depth to open the sampler, secure the drive rods, and disconnect the slide hammer.
- 7. Follow groundwater sample handling and collection procedures.
- 8. Remove the drive rods and hydropunch assembly. The casing and drive point remain in the borehole.

#### Monitoring Well Installation

Augers are advanced to the required depth and the drill rods are removed. The augers are used to allow proper placement of the well casing and annular materials. Monitoring well construction specifications are outlined in the workplan and drilling file. Well installation can be a tedious process with several potential problems. The licensed well driller ultimately decides how the well installation will proceed.

- 1. Assemble a new well casing (screen and blank pipe) with a locking cap and end cap.
- 2. Lower assembly into the borehole through the hollow stem augers.
- 3. Pour sand inside the augers, according to the licensed well driller's instructions.

- 4. Once the sand pack is in place, place the annular seal according to the licensed well driller's instructions.
- 5. Complete the well by setting an access box in a concrete apron.
- 6. Tag or label the well with the number.

#### **Direct Push**

Direct push uses a pneumatic hammer and hydraulic piston to advance soil and groundwater samplers or hollow drive rods to hold the borehole open during monitoring well installation. Rods are constructed in 5-foot lengths of heavy-duty steel that connect together. Caution is advised when lifting heavy rods.

#### Soil Sampling (Macrocore)

A piston rod soil sampler (Macrocore) connected to the lead drive rod is advanced to the specified depth, the piston rod is removed, and the sampler is advanced to the appropriate depth and retrieved (Figure 6).

#### Sampler Assembly, Advancement, and Sample Collection

- 1. Assemble a clean Macrocore as specified. Check and replace damaged O-ring seals.
- 2. Attach the Macrocore to the drive rods.
- 3. Advance the Macrocore to the specified depth.
- 4. Remove the piston rod.
- 5. Advance the Macrocore through the desired sampling interval (4 feet or less).
- 6. Retract the sampler.
- 7. In a clean work area remove the core from the sampler.
- 8. Cut open the plastic liner.
- 9. Follow soil sample handling and collection procedures.

#### *Groundwater Sampling (Screen Point Sampler)*

A screen-point sampler connected to drive rod(s) is advanced to the specified depth (Figure 7). The sheath is retracted to expose the screen and a bottom tubing check ball pump or peristaltic pump is used to collect groundwater samples.

#### Screen Point Sampler Assembly and Advancement

- 1. Assemble a clean screen point sampler with new expendable drive point. Check and replace damaged O-ring seals.
- 2. Attach the sampler to the drive rods with new O-rings placed on the top of each rod.
- 3. Advance the sampler to the specified depth.

4. Retract the drive rods to expose the screen (4 feet or less).

#### **Groundwater Collection**

- 1. Slowly lower the specified sampling device to the bottom of the screen point sampler.
- 2. Follow groundwater sample handling and collection procedures.
- 3. Remove the drill rods and sampler assembly.
- 4. The drive point remains in the borehole.

#### Monitoring Well Installation

3.25-inch diameter hollow drive rods are advanced to the required depth with an expendable tip. The hollow rods are used to allow proper placement of the well casing and annular materials. Monitoring well installation specifications are outlined in the workplan and drilling file. Well installation can be a tenuous process with several potential problems. The licensed well driller ultimately decides how the well construction will proceed.

- 1. Assemble a new well casing (screen and blank pipe) with a locking cap and end cap.
- 2. Lower assembly into the drive rods.
- 3. Pour sand inside the rods, according to the licensed well driller's instructions.
- 4. Once the sand pack is in place, place the annular seal according to the licensed well driller's instructions.
- 5. Complete the well by setting an access box in a concrete apron.
- 6. Tag or label the well with the number.

#### **Hand Auger**

A hand auger uses an auger bucket and connecting rods to remove soil from a borehole for the purpose for advancing a boring to a sampling depth. A sampler is then used to collect soil samples or a casing is installed to hold the borehole open. 1-inch diameter monitoring wells can also be installed. Buckets are typically one foot long. Connecting rods are typically constructed in 4-foot lengths of steel. A hand auger is used when drill rig access is limited, utilities are too close, or the total depth is generally less than 5 feet.

#### Soil Sampling

A steel push tube is used to collect soil samples (Figure 9). The sampler is connected to drive rod(s) and is advanced to the specified depth using a slide hammer. Sampler is

retrieved by hammering in the opposite direction. Refer to soil sample collection and handling procedures.

#### Groundwater Sampling

A slotted casing is installed to the specified depth for the retrieval of groundwater grab samples and recording of depth-to-water measurements (Figure 10). A bailer or peristaltic pump is typically used to collect groundwater samples. Refer to groundwater sample collection and handling procedures.

#### Monitoring Well Construction

Auger the borehole to the required depth (Figure 11). Monitoring well construction specifications are outlined in the workplan and drilling file.

- 1. Assemble a new well casing (screen and blank pipe) with a locking cap and end cap.
- 2. Lower assembly into the borehole.
- 3. Pour sand and place the annular seal according to the well driller's instructions.
- 4. Complete the well by setting an access box in a concrete apron.
- 5. Tag or label the well with the number.

## MONITORING WELL DEVELOPMENT AND SURVEYING Monitoring Well Development

Following installation of a monitoring well it must be developed before it is brought into service. Developing a well removes sediment in the sand pack and on the borehole wall, and maximizes recharge to the well. Monitoring wells are to be developed prior to setting the seal or a minimum of 72 hours after setting the seal, according to procedures generally described in 40 CFR 264.175.

- 1. Measure and record total depth of boring and depth-to-water for each well to be developed. Depth-to-water will be measured with an electronic depth sensor or engineers tape (0.01-foot increments) and water sensitive paste. Measurements will be recorded to the nearest 0.01-foot from the top of casing (TOC).
- 2. Develop wells by slowly inserting and withdrawing an appropriately sized surge block through the entire water column without rising above the water surface. This is *surging* the wells.
- 3. After 5 minutes quickly remove the surge block and insert a submersible pump with the intake no less than 2 feet off the bottom. If well diameter is too small for a submersible pump, a bailer should be used.
- 4. Purge water from the well at a rate of 1 to 2 gallons per minute [gpm], until clarity is reached. This is *purging* the well. Surging and purging may be repeated as necessary, but should be progressively gentler.
- 5. Complete a monitoring well field worksheet (Attachment 5).
- 6. A newly developed well is to be sampled no sooner that 24 hours after development. Refer to SOP No. 2 for monitoring well sampling procedures.

#### Wellhead Surveying

The reference elevation with respect to NAVD-88 for the top of casing (TOC) for each monitoring well or temporary screening well will be determined by survey to the nearest 0.01 foot. Surveys are to be performed under the supervision of a licensed land surveyor with the appropriate equipment and operated and calibrated in accordance with the manufacturer's recommended procedures. In all cases, wells shall be located horizontally under the supervision of a licensed land surveyor to the State Plane Coordinate System.

#### REFERENCES

ASTM D-2488 40 CFR 264.175 California Well Standards Bulletin 74-81 California Well Standards Bulletin 74-90

#### **LIST OF FIGURES**

Figure 1	Soil Sampling with Solid Flight Augers
Figure 2	Groundwater Sampling with Solid Flight Augers
Figure 3	Soil Sampling with Hollow-Stem Rotary Augers
Figure 4	Hydropunch Sampling with Hollow-Stem Rotary Augers
Figure 5	Monitoring Well Construction with Hollow-Stem Rotary Augers
Figure 6	Direct-Push Soil Sampling with Macrocores
Figure 7	Direct-Push Depth-Discrete Groundwater Sampling
Figure 8	Direct-Push Monitoring Well Construction
Figure 9	Hand-Auger Soil Sampling
Figure 10	Hand-Auger Groundwater Sampling
Figure 11	Hand-Auger Monitoring Well Construction

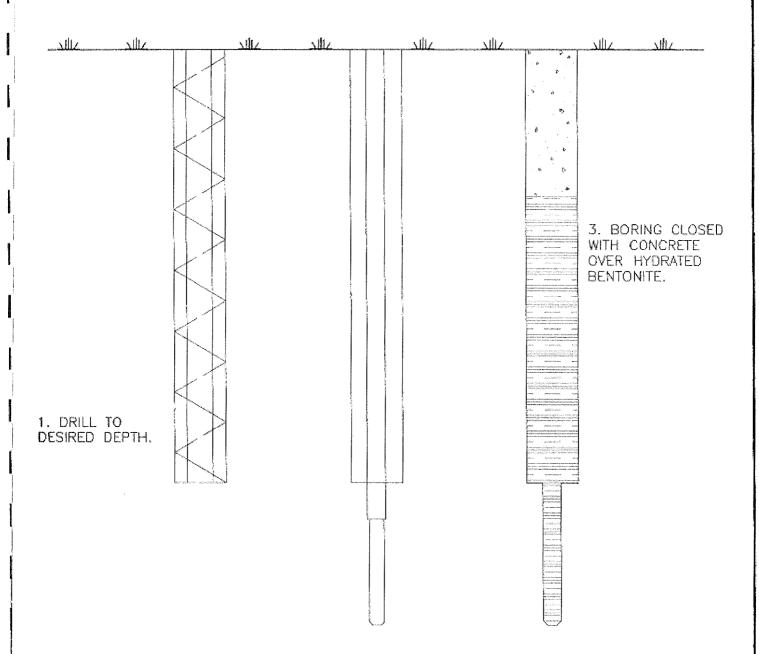
#### LIST OF ATTACHMENTS

Drilling File Checklist
Field Safety Meeting Form
Soil Boring Log
Chain of Custody
Monitoring Well Sampling Field Form

#### **FIGURES**



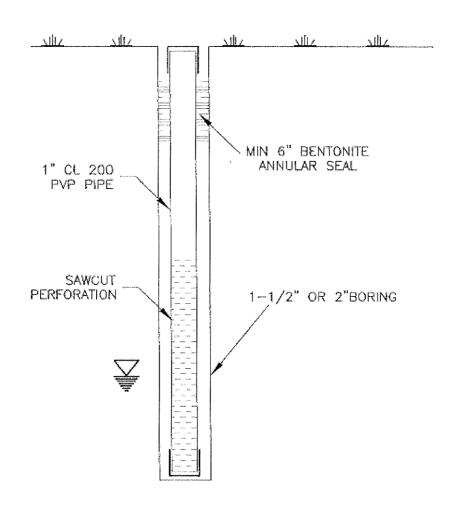
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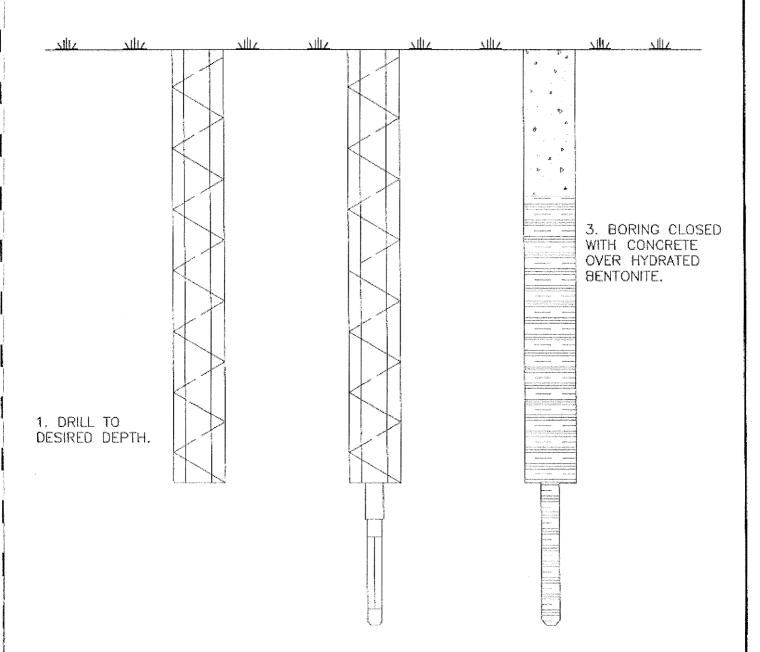
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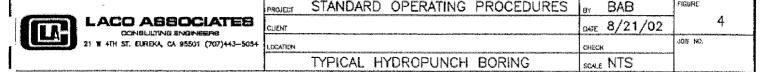
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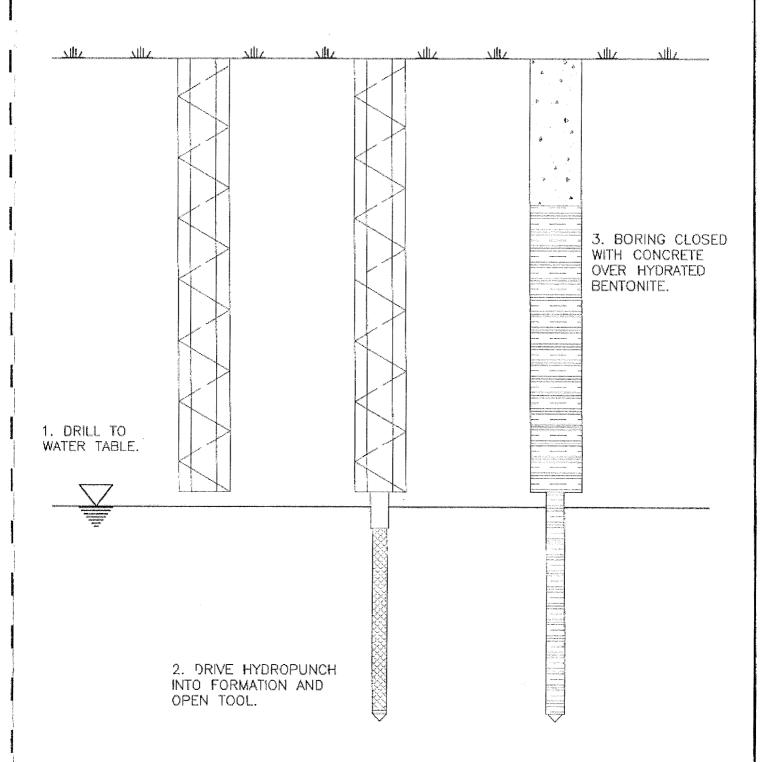
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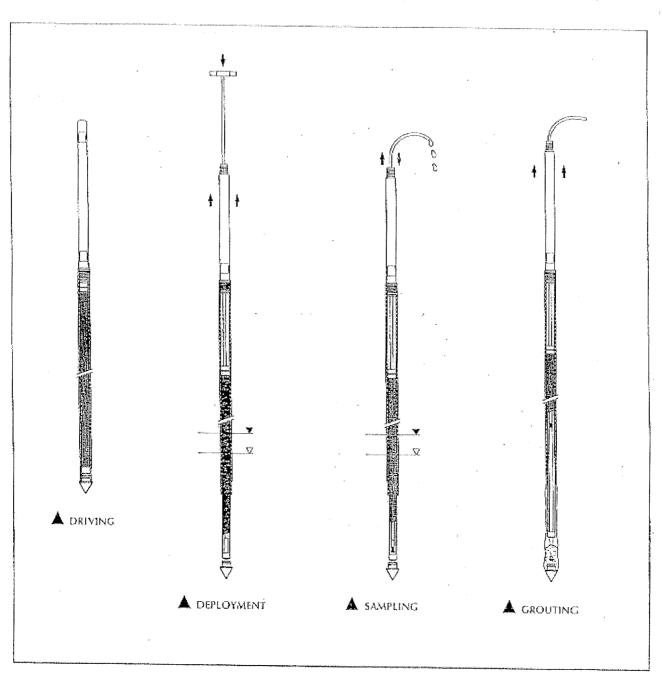


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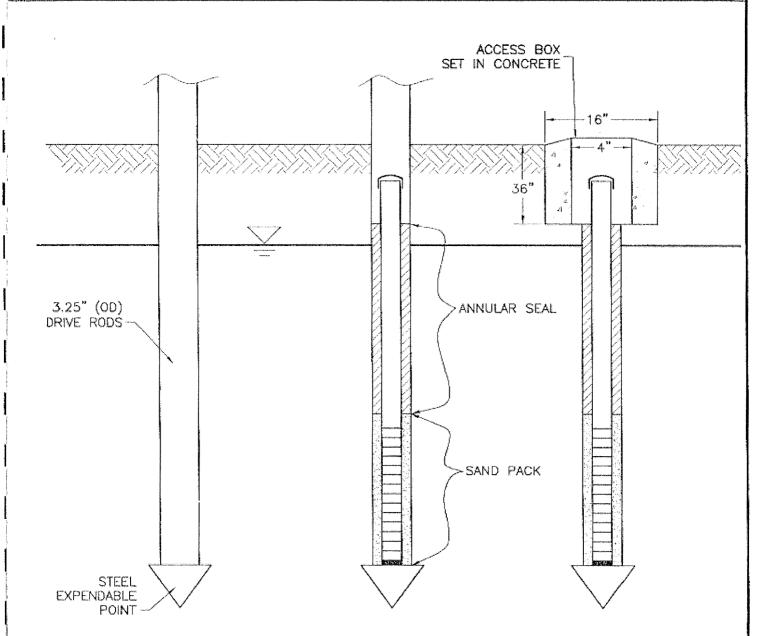
## GEOPROBE® SCREEN POINT 16 GROUNDWATER SAMPLERS





PROJECT STANDARD OPERATING PROCEDURES BY BAB FIGURE 8

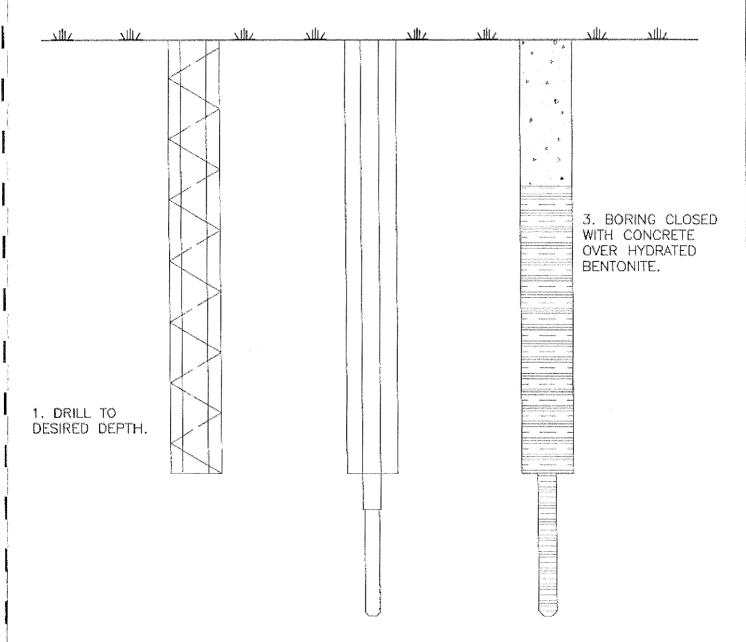
CLIENT DIRECT PUSH MONITORING WELL SCALE NTS



1. DRIVE SEALED DUAL TUBE TO TOTAL DEPTH 2. SET 1.5" PVC SCREEN & BLANK PIPE & ANNULAR MATERIALS, EXTRACT RODS 3. SET ACCESS BOX IN CONCRETE 36"x16"



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2. REMOVE AUGER AND DRIVE SAMPLER INTO FORMATION, THEN REMOVE SAMPLER.

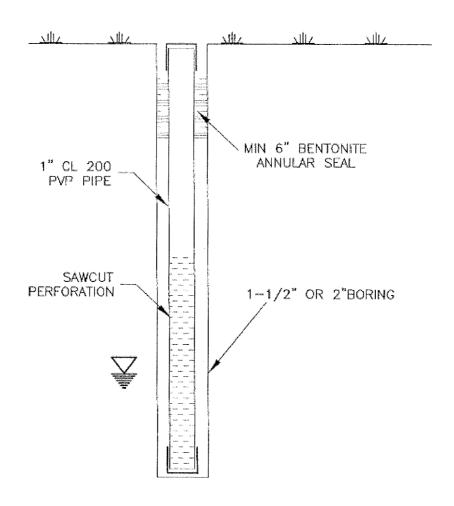


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TYPICAL HAND AUGER GROUNDWATER SAMPLING SCALE NTS

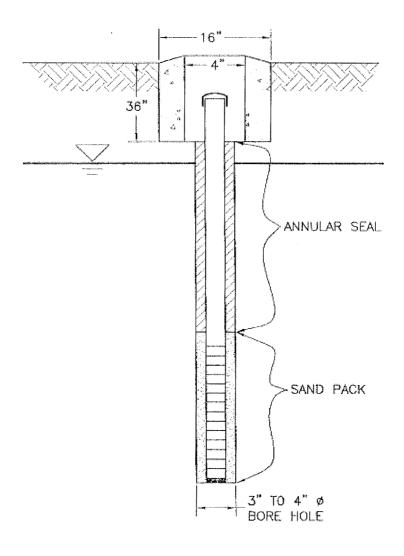


A. SCREENING WELL (NO WELLPOINT)

USED IN AREAS FREE OF SURFACE CONTAMINATION OR OTHER CONTAMINATION NOT CURRENTLY IN CONTACT WITH GROUNDWATER CLOSED WITHIN 72 HOURS.



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	TYPICAL HAND AUGER MONITORING WELL	SCALE NTS	



1. HAND AUGER TO DESIRED DEPTH

2. SET 1" TO 1.5" PVC 3. SET ACCESS BOX SCREEN & BLANK PIPE IN CONCRETE 36"x16" & ANNULAR MATERIALS.

#### **ATTACHMENTS**

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51	Material and the control of the cont	10 c 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	🗆 🧀 Private Property Owners	
51		- bion-mai-ac-de-de-	C Public Agencies	
40	mmaninga.		🗖 🖔 Well hardware list, (Drilling File Form-4), created by Geologist, given to a	DC
40	V-16300-10-10-10-10-10-10-10-10-10-10-10-10-1		Well hardware ordered, (See Drilling File Form-4) ordered returned to Geologist	d by DC and form
40			☐ Laboratory container order, ordered by DC	
33	www.mog.accepts accepts		Schedule of Site Markings, Geologist arranges for site to be USA marked by	field tech
33	MAGAZILI SAN		Site Markings, Field tech marks site, signs and dates site map, su geologist (5 days prior to drilling day)	bmits to PM and
33	***************************************	······································	☐ Meeting-DC meets with Geologist to discuss USA description of work area	
		P	roject Manager (5 days prior to drilling day)	. **** > > ***
33	www.compression.com	na ottomasjeu tugi	USA contact and #, PM calls in ticket and records start work date and time	le.
			ticket # and renewal date (5 days prior to drilling) (See Drilling File Fon	m-2)
48			** Regulatory agency contact, PM calls regulatory agency with confirmed st	art data
	ata a construction and a special and a speci		(I to 2 days prior to drilling day) (See Drilling File Form-2)	ras a citatic
Bring diversion on the	**************************************		The first state of the first sta	
40		F	roject Manager (1 day prior to drilling day)	
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MODERNI MANAGEMENT AND SECOND		************		TERM OF THE COMP
		(	Geologist	
40	monoconomic model	Necessary although the residence of	☐ Field Notes, collected by Geologist(5 days after drilling)	3 4 5 · 1 · 1 · 5 · 5 · 5 · 5 · 8 · 8 · 8 · 8 · 8 · 8
40	***************************************	NEWSTON VITE	☐ 第 Boring and well construction logs	
40	***************************************	er State of the ball	☐ In Field notes and drawings	
40	Reserve Constitution of the American	- en saturas materinati	☐ M Equipment and supply billing forms	
40	(0.10000 as a consessor message	***************************************	☐ ® Chain of Custody for analytical lab samples	
40	***************************************	· · · · · · · · · · · · · · · · · · ·	☐   Written summary of work performed	
40 Form	51	ta bara ta strage	Completed site safety form, submit copy to LACO safety officer.	, (See Drilling File
Form	J			
***************************************	***************************************	Maria de Carres	roject Manager	Pri in Pri i i i i i i i i i i i i i i i i i i
40			[1] Drilling file review, PM reviews file and distributes appropriate information	
	To development and a solid	WAS COMES THAT A SEC	(5 days after drilling)	•



### LACO ASSOCIATES CONSULTING ENGINEERS (707) 443-5054

# FIELD SAFETY MEETING

Complete and return to LACO Safety Officer

PROJECT NAME / NUMBER:	DATE:
MEETING HELD BY:	
PERSONS ATTENDING:	
	$oldsymbol{q}$ and $oldsymbol{q}$ $oldsymb$
HAZARDS NOTED & DISCUSSED:	
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D Sip, Trip Fell;	
□ Personal Protective Equipment;	
🗇 Public Safety Protection;	
🗆 Hidzardows Materials;	C les chammer anno anno anno anno anno anno anno ann
D Emergency Action Plan;	
ATTENDEES SIGNATURES:	

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# Chair of Custock

LABORATORY NUMBER:

31.	
Attention:	Costo Canal County Coun
Results & Invoice to:	PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES
	REPORTING REQUIREMENTS: State Forms
	NAME OF TAXABLE PARTY.
Copies of Report to:	
Sampler (Sign & Print):	CONTAINER CODES: 1—1/s gal. pl; 2—250 ml pl;
PROJECT INFORMATION	6—500 ml BC; 7—1 L BC; 8—1 L cg; 9—40 ml VOA;
Project Number:	13—brass tube; 14—other
Project Name:	PRESERVATIVE CODES; a—HNO.; b—HG; c—H,SO.;
Purchase Order Number:	dNa,S,O,; eNaOH; fC,H,O,Čl; gother
LAB ID SAWPLE ID DATE TIME MATRIX*	SAMPLE CONDITION/SPECIAL INSTRUCTIONS

\*MATRIX: DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

Bus Hand

CHAIN OF CUSTODY SEALS Y/N/NA SHIPPED VIA: UPS Air Ex Fed Ex B

☐ NCL Disposal of Non-Contaminated

C Return

SAMPLE DISPOSAL

DATECTIME

RECEIVED BY (Sign.)

DATE/TIME

RELINQUISHED BY (Sign & Print)

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

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